

TRAUMATIC BRAIN INJURY: A CASE FOR PREVENTION

A Report by the Massachusetts Traumatic Brain
Injury Prevention Task Force

Convened by the Massachusetts Department of Public Health

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EXECUTIVE SUMMARY

Traumatic brain injuries (TBI) are a serious public health problem with potentially devastating effects and far-reaching consequences. In Massachusetts alone in 2004, there were 486 TBI-related deaths. In addition, there were 6,220 hospital stays and 37,298 emergency department discharges associated with a non-fatal TBI. TBI, like most injury, is highly predictable and preventable, but most of the efforts and resources of our health care system go into treatment and rehabilitation, not prevention.

TBI is costly to treat, both for the health care system, and for the caregivers of those afflicted. Acute care charges in Massachusetts for the year 2004 exceeded \$257 million, not including emergency medical services, lost wages, rehabilitation or follow-up care. And for those who suffer a brain injury, the long-term costs over a lifetime of care are enormous.

Traumatic brain injury, also characterized as “the silent epidemic,” has recently received increased attention as it has become the signature wound of the Iraq war. It is estimated that 60 percent of soldiers recently wounded in Operation Iraqi Freedom have sustained blast injuries and doctors estimate that between 60% and 80% of these blast-injured soldiers have TBI. Because many of these may not be diagnosed immediately, the Department of Defense must now screen US troops both before and after they are deployed to Iraq or Afghanistan to better determine whether they sustained brain damage in combat. As our nation turns its attention to improving diagnosis and care of injured soldiers, it is also time to act aggressively to implement known, effective prevention strategies.

In the spring of 2005, the Massachusetts Department of Public Health (MDPH) convened a TBI Prevention Task Force as part of the implementation of the MDPH Strategic Plan for Injury Prevention. This report describes the rationale for the creation of the Task Force and a summary of the recommendations that were generated to address gaps in prevention.

Recommendations fall into several areas that were identified as priorities for TBI prevention:

- falls among the elderly;
- motor vehicle crashes;
- childhood injury (including sports and recreation injuries);
- workplace falls;
- abusive head trauma in infants;
- and suicide.

The recommendations are organized by a traditional injury-prevention framework that considers surveillance and data-gathering, infrastructure, environmental modifications, policy and enforcement, and education and training. They include interventions and policies aimed at reducing the incidence and severity of traumatic brain injury, and are

intended to serve as a blueprint for clinicians, medical professionals and government leaders in attacking the public health problems presented by TBI.

INTRODUCTION AND BACKGROUND

Traumatic brain injuries (TBI) are a serious public health problem with potentially devastating effects and far-reaching consequences. These injuries occur following a blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain¹. TBIs can cause death or lasting disability that can significantly impact victims, their families, their communities and the state. Traumatic brain injury is highly predictable and preventable, but most of the efforts and resources of our health care system go into treatment and rehabilitation, not prevention.

TBI affects people of all ages and is the leading cause of long-term disability among children and young adults.² An estimated 1.4 million individuals sustain a TBI each year in the U.S.³ Compared with other conditions, the incidence of TBIs occurring in the United States is approximately eight times higher than the number of breast cancer diagnoses and 34 times the number of new cases of HIV/AIDS.⁴

The consequences of TBI may cause profound changes in the person's life. The majority of individuals with a moderate or severe TBI suffer significant physical, behavioral, psychiatric, cognitive, and medical problems. These problems have a negative impact on the functional independence, community participation and living skills, vocational success and psychosocial development of people with TBI. Research has shown that TBI can contribute to dropping out of high school, unemployment, substance abuse, suicide and criminal activity.⁵ TBI can also cause epilepsy and increase the risk for conditions such as Alzheimer's disease, Parkinson's disease, and other brain disorders that become more prevalent with age.⁶

In addition to the personal and medical consequences, TBI is also costly to treat. In Massachusetts, the total acute care charges for TBI hospitalizations, observation stays, and emergency department visits alone (not including emergency medical services, lost wages, rehabilitation or follow-up care) exceeded \$257 million in 2004. The proportion of this paid by public sources, including Medicaid and Medicare, ranged from 32% to nearly 50%.

The long-term costs for those chronically impacted are also enormous. The number of people surviving TBI with impairment has increased significantly in recent years. This is attributed to faster and more effective emergency care, quicker and safer transportation to specialized treatment facilities, and advances in acute medical management.⁷ The U.S. Centers for Disease Control and Prevention estimate that at least 5.3 million Americans currently have a long-term or lifelong need for help to perform activities of daily living as a result of a TBI.⁸ According to one study, about 40% of those hospitalized with a TBI had at least one unmet need for services one year after their injury.⁹

According to the Massachusetts Statewide Head Injury Program (MA-SHIP), in Massachusetts, 70 individuals with TBI receive state-supported residential services at an annual cost of \$8.7 million/year and many more receive a broad array of services ranging from day programs, respite care, assistive technologies, and community supports to case management and transportation programs at an annual cost to the Commonwealth of over \$4.7 million. While MA-SHIP reports nearly 4000 eligible individuals with TBI in their database, only approximately 1000 of these people --- one in four-- are covered for these services and many of these individuals are not receiving all of the services that they need. Furthermore, there are many more residents with TBI who do not meet the eligibility requirements of MA-SHIP and yet have a need for services.

Due to the large toll of TBI and the absence of a cure for brain injury, prevention is of paramount importance. Efforts to reduce the impact of TBIs among Massachusetts residents extend across a continuum ranging from primary prevention, to improving the medical management and provision of high quality treatment services among those who have been injured. Most of the current efforts and resources of our health care system are directed toward treatment and rehabilitation, not primary prevention. This is despite the fact that the sequence of events leading up to most TBIs is highly predictable and preventable.

Many private non-profit and public agencies, including the Massachusetts Department of Public Health's Injury Prevention and Control Program and Injury Surveillance Program, have long focused their surveillance and prevention efforts on TBI, but there has been little coordination among individual efforts. In the spring of 2005, the Massachusetts Department of Public Health (MDPH) convened a TBI Prevention Task Force as part of the implementation of the MDPH Strategic Plan for Injury Prevention.

I. Data on Traumatic Brain Injury in Massachusetts

In Massachusetts there were 486 TBI-related deaths among residents in 2004, and TBI was associated with 19% of all injury deaths (2,615). In that same year, there were 6,220 hospital stays; and 37,298 emergency department (ED) discharges associated with a non-fatal TBI.¹⁰ Nearly 36% of TBI inpatient hospitalizations were followed by discharge to a skilled nursing care facility, rehabilitation or other similar institution.

The leading causes of TBI deaths in 2004, were falls (38%), followed by firearms (23%) and motor vehicle occupant injuries (19%) for all ages combined. MV-occupant injuries, however, are the leading cause of TBI death in residents ages 15-24. Of all TBI deaths, 68% were unintentional; an additional 16.5% were suicides and 9% were homicides.

In the case of non-fatal TBIs, falls were again the leading cause, accounting for over 40% of all TBI-related hospital stays and emergency department visits in 2004. Motor vehicle occupant injuries accounted for 22% of all TBI-related inpatient hospitalizations and 17% of all TBI-related emergency department visits. Strikes to the head by an object or person were a leading cause of emergency department visits for TBI; many of these injuries were related to sports and recreation.

TBI-related death and inpatient hospitalization rates are highest among individuals ages 85 years and older. Emergency department discharge rates (for patients not requiring admission) were highest among infants less than one year of age. Infants less than one year old also have the highest rates of TBI-related homicide in Massachusetts; this includes cases of Shaken Baby Syndrome as well as other forms of abusive head trauma.

Work-related traumatic brain injuries accounted for nearly 2,000 inpatient hospitalizations and emergency department visits in 2004. Falls are the leading cause of these injuries and are the leading cause of death in the construction industry in Massachusetts. Falls to a lower level accounted for 62% of deaths among construction workers in Massachusetts.¹¹ Of these 92 fatal falls, 59 (64%) were TBI-related. Work-related TBI hospitalization rates are highest among workers ages 65-74 years, but the total numbers are highest among workers 25-34 years of age. TBI emergency department visit rates were highest among workers 20-24 years of age.

Based upon the findings from this surveillance data, the following areas were identified for recommendations aimed at the primary and secondary prevention of these injuries:

- Falls among the Elderly
- MV Occupant Injury
- Childhood Injury (including sports and recreation safety)
- Falls in the Workplace
- Abusive Head Trauma in Infants
- Suicide

II. The Response to TBI in Massachusetts

Traumatic brain injury is a largely unrecognized public health problem. Resources are directed primarily at the acute treatment of TBI and rehabilitation, with policy makers and the general public largely unaware of the effectiveness of prevention. The prevention efforts that exist are fragmented and driven mainly by the availability of limited federal grant funding. The Massachusetts Injury Prevention Yellow Pages, created by the Massachusetts Department of Public Health, lists 30 injury prevention organizations statewide that focus on the main causes of TBI which are traffic-related injury, falls, and occupational injuries; however no comprehensive statewide program exists to coordinate these efforts.

In the spring of 2005, in response to the release of compelling data on TBI by the Injury Surveillance Program at MDPH, the Massachusetts Traumatic Brain Injury Prevention Task Force was formed and chaired by MDPH Associate Commissioner, Sally Fogerty. Experts in TBI from diverse disciplines were invited by MDPH to participate based on the assumption that combining the efforts of many groups under a common plan would strengthen each individual effort and would enhance the efficiency and success of each group's interventions. Members were asked to make a one-year commitment to the Task Force.

A total of 61 professionals from 32 organizations joined the Task Force (see Appendix A for a list of participating organizations). Based on a thorough review of TBI data, the Task Force decided to work through six topic-related subgroups:

- 1) The Shaken Baby Syndrome Advisory Committee (already existing prior to the Task Force);
- 2) The Partnership for Passenger Safety (also pre-existing, focusing on motor vehicle related injuries);
- 3) The Massachusetts Coalition for Suicide Prevention (pre-existing);
- 4) Preventing Falls in Construction Workgroup (pre-existing);
- 5) Falls among the elderly (new); and
- 6) Children's safety (new).

In addition to what is currently known about TBI among MA residents, there are several “emerging areas” which may require attention in the near future but where, so far, the data are limited. These include TBI occurring in residents who are serving in the armed services and National Guard, as well as elders residing in skilled nursing and assisted residential facilities. These areas of need were discussed by the full Task Force, and recommendations for prevention pertaining to these populations were incorporated into this report.

The goal of each subgroup was to produce recommendations for preventing TBI. They were asked to identify strategies that were behavioral, legislative and environmental, in keeping with scientifically-established injury prevention practice. The subgroups were also asked to identify strategies that could be implemented through existing programs and to identify those programs that require additional resources. Finally, the subgroups were asked to consider the development of “cross-cutting” recommendations that would include more than one strategy. The full Task Force met three times - at the beginning, the middle, and the end of the year – to establish and review the work of the subgroups.

What follows are the recommendations made by the subgroups as well as the cross-cutting recommendations. They follow a traditional injury prevention framework that considers surveillance and data-gathering, infrastructure, environmental modifications, policy and enforcement, and education and training.

Task Force Recommendations on Prevention Strategies

In developing strategies for preventing TBI, the Task Force based its recommendations on the five-component injury prevention framework¹:

- **Surveillance:** How good are the data on TBI? How can we improve the data we collect and how can we best use data to craft effective interventions?
- **Infrastructure:** How can we optimally combine our diverse efforts to develop a unified approach to this complex set of injuries?
- **Environmental Modifications:** Since research shows that passive interventions – those that require no conscious behavioral changes on the part of the individual (such as air bags or pre-set hot water heaters) – will have the biggest impact, how can we implement the improvements in environmental engineering and product design available in our state?
- **Policy and Enforcement:** How can we best encourage compliance with our existing safety laws? Do we need further legislation to reduce the risk of TBI? How can we most effectively educate our legislators and the public, especially those population groups that are hardest to reach such as teenagers and elders?
- **Education and Training:** What are the best strategies to efficiently and effectively train professionals who work with the public to identify and intervene in high risk behaviors? How can we raise public awareness about TBI and the need for prevention to reduce high risk behaviors?
- Finally, the subgroups were asked to consider the development of “**cross-cutting**” strategies that would include more than one of the above five prevention components.

The first component, **Surveillance**, is prerequisite to the other four components, and the second, **Infrastructure**, is prerequisite to the next three.

A. Surveillance and Evaluation

Rationale

The success of public health interventions targeting traumatic brain injury relies on the ongoing and systematic collection, analysis, interpretation, and dissemination of data. Data are needed to inform decisions about interventions as well as to evaluate the effectiveness of these efforts in preventing morbidity and death from TBI. Existing surveillance provides only a partial picture of the circumstances leading to, and risk factors for, TBI in Massachusetts.

Knowing the causes and circumstances behind TBI is imperative for developing effective prevention strategies. In Massachusetts, most of the information on traumatic brain injury is obtained from vital statistics and statewide hospital discharge data. For a case of an

¹ See Appendix B: Injury Framework and Pyramid

injury or death to be identified as TBI related in these databases, it must have received one or more International Classification of Disease (ICD) codes fitting the CDC definition of TBI. As such, TBI data is dependent on multiple factors, including the diagnosis and documentation of the injury and its cause in the medical record or in the death certificate. Certain TBI-related injuries and fatalities, therefore, go uncounted due to their classification as a different injury type (e.g. “multiple traumatic injuries”).

Additionally, statewide databases, including hospital discharge and emergency department datasets, lack data variables that describe a person’s activity at the time of injury. An inability to link different datasets, barriers to data-sharing, and the lack of a standardized coding system for injury data are obstacles leading to incomplete surveillance of TBI in the Commonwealth.

Surveillance Strategies

1. Support and promote the newly-created MA Trauma Registry and statewide EMS database providing detailed information on the severity, pre-hospital management, sequence of events leading to injury, and outcomes of TBIs.
2. Improve the capacity of surveillance systems to identify the activity the individual was engaged in at the time of injury, including TBIs due to sports and recreation, work, and other activities.
3. Support the efforts of the MA Traffic Records Coordinating Committee, under the Chair of the Governor’s Highway Safety Bureau, to improve the completeness and accuracy of the MA Crash Database maintained by the Registry of Motor Vehicles. Work with the CODES project, which links medical data to the crash file, to promote the creation of a queriable database of transportation injuries with search variables, similar to the FARS database, including alcohol use, ejection path, rollover, and address/location of crash.
4. Advocate for the inclusion of data variables that indicate whether an injury is related to a person’s work in statewide databases such as the inpatient hospital discharge, emergency department, EMS, and trauma registry.
5. Ensure that evaluation is an integral component of all TBI prevention strategies.
6. Develop a framework for piloting the development of a multidisciplinary Elder Injury Fatality Review Team under the direction of the Office of the Chief Medical Examiner (OCME) to improve data collection, provide an in-depth understanding of the circumstances of fatal elder TBIs due to falls, motor vehicle crashes and other preventable causes, and to make system-based recommendations for prevention.
7. Improve the public health surveillance data on circumstances that lead to TBI through partnerships and data sharing agreements between OCME, MDPH, Health Care Finance and Policy (HCFP), hospitals and others.

B. Infrastructure

Rationale

The Massachusetts Traumatic Brain Injury Task Force recognizes that no one agency alone can reduce the incidence of TBI. The recommendations below emphasize interdisciplinary collaboration, with partners from a wide spectrum of public agencies, the private sector, institutions and community organizations.

Currently, TBI prevention efforts are largely fragmented, with a focus on injury cause and with little collaboration across injury topics. The data on TBI indicates that the causes of both fatal and non-fatal TBI cut across several different types of injuries including falls, firearms, traffic crashes, suicide attempts, occupational injuries and others. Due to the diversity of injury causes, a unified effort is necessary for an overall reduction in the incidence of death and disability associated with TBI. Resources and strategies must be coordinated among all stakeholders involved in prevention, and efforts at all levels of prevention, from community to statewide, should be organized into a planned program with unified strategies and established protocols.

Infrastructure Strategies

1. Promote a coordinated approach to the management of sports-related concussions among children and youth. With input from coaches, guardians, physicians, trainers, brain injury professionals and administrators, improve or establish processes that ensure the coordination of care and facilitate communication on return to play among youth who sustain a sport-related concussion.
2. Promote collaborative efforts among public health, law enforcement, and public safety to increase helmet use in accordance with the Massachusetts Bicycle Helmet Law.
3. Increase availability and referrals to programs that support young parents, including home visiting networks for young parents and parents who may be at risk of injuring their child.
4. Support coordination among traffic programs, law enforcement, public safety, community planners, maternal and child health programs, health educators and hospital-based injury prevention programs to promote pedestrian and bicycle safety.
5. Maintain a working group of stakeholders to increase coordination of efforts to reduce falls in residential construction. Stakeholders should include employers, employee representatives, community organizations, insurers, safety researchers, and relevant government agencies.
6. Support the Massachusetts Healthy Aging Initiative to implement recommendations from the document “Fall Free: Promoting a National Falls Prevention Action Plan,” developed by the National Council on Aging.

7. Create local chapters of national injury prevention programs with a focus on community-based prevention.
8. Encourage collaboration between public health and transportation to ensure that all new roadway design projects include elements to encourage safe walking and bicycling.
9. Encourage collaboration between public health and the Registry of Motor Vehicles to evaluate the effectiveness of driver education programs.

C. Engineering/ Environmental Modifications

Rationale

Injury prevention strategies aimed at changing the physical environment are among the most successful injury control interventions. Examples include creating bike lanes and paths to provide cyclists with an alternative to riding on roadways and improving play areas, like playground surfaces and baseball diamonds for safer play. Engineering and environmental modification involves making changes to the physical environment and influencing the design, development and manufacturing of safety products. Certain aspects of the built environment increase the potential for injury. Understanding these environmental characteristics and their safety risk provides opportunities to modify the environment to remove or reduce hazards, thus reducing the risk of injury exposure. Environmental modifications are useful because they do not require behavioral change to be effective and because a single modification has the potential to protect a large number of people.

Engineering/Environmental Modifications Strategies

1. Work with city and state planners to implement contrast markings on public stairways and sidewalks, and to integrate universal safety design¹² into planning initiatives.
2. Identify and recognize “fall safe” communities in Massachusetts. A fall-safe community is one in which the physical environment is constructed/modified to be as safe as possible; the transportation system follows falls prevention procedures, and bureaucratic, corporate and social institutions provide the necessary infrastructure support.¹³
3. Implement environmental modifications to provide safe spaces for walking and biking such as painted crosswalks, “counting” walk signals, bike paths, sidewalks, and alternative structures, including overpasses and tunnels.
4. Provide older adults with resources for home safety measures including information, home safety reviews, home modifications that reduce home hazards, improve independent functioning and lower the risk of falls.

5. Restrict access to firearms by individuals at high risk for suicide.
6. Erect barriers on highway bridges and restrict access to roofs to prevent jumping.
Erect barriers on train tracks.
7. Reduce suicidal behavior by restricting access to lethal means in state-licensed group living facilities (e.g. nursing homes, group homes, detention centers) by, for example, preventing access to roofs of buildings and eliminating hardware such as unbreakable shower rods that could be used as a fixed point from which to attach a rope for hanging.
8. Encourage smart growth¹⁴ near public transportation and expand public transportation options to communities outside of urban areas, to reduce traffic volume and encourage safe space for walking and biking.

D. Policy and Enforcement

Rationale

Policy and enforcement refer to the use of legal requirements and prohibitions to reduce the risk of exposure to injurious events. Research indicates that laws requiring behavioral change, when combined with public education, can be more effective in promoting long-term behavioral change than educational strategies alone. Members of high-risk groups, in particular, tend to be the hardest to influence with education and, therefore, stand to benefit the most from mandated changes in individual behavior. For example, teenage drivers in Massachusetts are less likely to wear safety belts than are adults. Primary enforcement safety belt legislation in other states has resulted in dramatic increase in safety belt use among this hard-to-reach group.

Policy and Enforcement Strategies

1. Increase restrictions on the graduated driver's license system and ensure that it is both enforceable and consistently enforced. Combine with an educational component to increase parents' awareness of the system and its benefits. Partner with high schools to promote enforcement of graduated driver's license.
2. Include Shaken Baby Syndrome education as a mandatory part of licensing for family day care providers and foster parents.
3. Incorporate safety and health questions regarding fall protection on relevant licensing exams for building trade contractors. Disseminate fall prevention materials at the time of licensing.

4. Advocate for the passage of primary seat belt legislation subject to primary enforcement and partner with law enforcement to create high visibility traffic education and enforcement campaigns.
5. Explore the feasibility of amending state building codes to require fall protections in new residential construction.
6. Enact booster seat legislation for children under 8 years old.
7. Increase high-visibility enforcement of alcohol-impaired driving, speeding and occupant protection of all motorists, including passenger vehicles, commercial vehicles and motorcycles.
8. Make annual medication review and appropriate modification a requirement of the Massachusetts Prescription Advantage Program and explore how it could be expanded to other insurance plans.
9. Require licensed health care facilities to meet the Joint Commission on Accreditation of Healthcare Organizations' (JACHO) national patient safety goals for fall prevention.
10. Support helmet legislation for appropriate sports and motorized vehicles.

E. Education and Training

1. Public Awareness

Rationale

Most Massachusetts residents are not aware of the magnitude of the TBI problem and do not view injury as a preventable public health problem. Due to a lack of awareness about the risk factors and circumstances that lead to traumatic brain injury, blame for TBI tends to be placed on the victim or to be seen as the result of a tragic, unpredictable “accident.” Such a view incorrectly perpetuates the idea that injuries are unavoidable and inevitable.

Injury surveillance has shown that injuries are highly preventable events with known risk factors and effective prevention strategies. Increasing public awareness about the preventable nature of traumatic brain injury and its associated economic and health burden to MA residents should result in more public support for prevention efforts. Increased understanding among policy makers may result in efforts to modify policies and allocate resources toward injury prevention efforts.

Public Awareness Strategies

1. Increase statewide awareness of risk factors for elder falls, including medication mismanagement, loss of balance/strength, vision deficits, postural hypotension and cognitive impairment.
2. Increase public awareness that falls are preventable events and that falls can and do cause traumatic brain injury. Provide older adults with the resources of evidence-based prevention programs available to improve physical mobility and skills to self-evaluate fall risk.
3. Educate elderly consumers that falling is a common adverse event associated with the use of some prescription and non-prescription drugs, herbal medications and/or the result of interaction of medications with alcohol, and teach older consumers about the questions to ask their doctors and pharmacists.
4. Develop Shaken Baby Syndrome public service announcements regarding infant crying, and promoting infant soothing techniques and parent stress management skills. Provide access to universal training for all parents of newborns about normal crying behavior, strategies for soothing crying infants and managing parental stress, and the identification of informal and formal supports for parents and the dangers of shaking.
5. Increase awareness of effectiveness of restrictions on new drivers' licenses and preventability of teen driving deaths.

2. Training for Professionals

Rationale

There are many different settings where health and human services professionals can intervene with individuals at risk for traumatic brain injury or can identify hazardous behaviors and high-risk environments. There are many opportunities in the Commonwealth to reduce the risk of TBI by implementing training programs for key health and human service personnel.

Professional Training Strategies

1. Provide patient education techniques to health care providers to increase awareness of falls risks associated with medication and alcohol use, and increase referrals to appropriate physical therapy. This recommendation is consistent with the work of the Department's AHRQ-funded Patient Safety project which includes a recommendation related to reconciling medications.

2. Provide health care and other elder service providers with the knowledge and skills to evaluate physical mobility and make appropriate recommendations.
3. Work with medical providers (pharmacists, nurses, doctors) to increase the numbers of adults who have an annual medication review focused on falls and fall-related injury prevention.
4. Identify or develop and disseminate a basic assessment tool to assess an individual's cognitive ability after a fall.
5. Create a network to implement evidence-based approaches (such as HEROS, and A Matter of Balance programs) designed to improve mobility and assess and reduce falls among elders.
6. Increase identification of construction-related fall hazards and enforcement of OSHA standards pertaining to these hazards by providing training and hazard identification tools to agents of local government such as municipal building inspectors, firefighters, and local public health staff.
7. Develop and disseminate model safety checklists to be completed by work crews prior to starting each window washing job.
8. Increase community-based outreach and education to provide linguistically and culturally appropriate construction-related health and safety training to construction workers and contractors.
9. Provide training for professionals and paraprofessionals including daycare providers, pediatricians and nurse practitioners, home visitors, and child care workers/ baby sitters about normal crying behavior, strategies for soothing crying infants and managing caretaker stress, and the dangers of shaking a child.
10. Provide training for professionals who work with fathers and male caretakers of infants about normal crying behavior, strategies for soothing crying infants and managing parental stress, the identification of informal and formal supports to access at times of increased distress or fatigue, and the dangers of shaking a child.
11. Provide suicide assessment and intervention training for health and human service professionals (mental health and substance abuse clinicians, elder services providers, primary care MD's, etc.).
12. Provide suicide prevention gatekeeper awareness education for rehabilitation personnel (e.g. physical therapists, nursing home staff, long-term caregivers), and for bridge toll takers.
13. Incorporate bilingual/ multicultural materials into state traffic safety programs. Train bilingual/multicultural CPS (child passenger safety) technicians.
14. Promote use of the CDC TBI toolkits (Heads Up: Brain Injury in your Practice. and Heads Up: Concussion in High School Sports) for coaches, administrators and physicians.

15. Incorporate pedestrian safety training into Head Start programs.
16. Promote inclusion of design-for-safety concepts and practices into the local universities' undergraduate/graduate curricula and training programs for architecture/engineering/design students and professionals. ("Design-for-safety" includes consideration of construction worker safety in the preparation of plans and specifications for construction projects.)
17. Provide training for emergency medical staff on the behavioral issues associated with TBI to promote better recognition and diagnosis of TBI and appropriate referral to services.
18. Work with medical providers to increase the number of adults age 64 years and older who receive annual vision examinations in order to reduce the risk of falling.

F. Cross-Cutting Strategies

1. Create a statewide pedestrian safety campaign, including increased enforcement of traffic violations near crosswalks, a public awareness campaign and environmental modifications to provide safe spaces for walking/biking.
2. Encourage use of alternative transportation options. Expand and/or improve public transportation options outside of major urban areas to decrease dependency on single occupant motor vehicle trips.
3. Create a statewide window fall prevention program modeled after Boston's Kids Can't Fly Program.
4. Provide older adults, caregivers and aging network organizations with home safety screening tools and resources for home modification.
5. Create a statewide Elder Falls Prevention Program based on comprehensive, evidence-based falls prevention programs such as the "A Matter of Balance" program.
6. Enlist local stakeholders to pilot and evaluate a model prevention program in several Massachusetts communities to prevent falls in residential construction and allied trades. This program should accommodate the needs of non-English speaking workers.

NEXT STEPS

Following review and endorsement of this document by the agencies and organizations involved in its development (see attached), action plans for implementation of the strategies will be developed. To expedite this step, a smaller work group will be convened to create an action plan that: identifies which agencies or organizations, alone or in collaboration, should be primarily responsible for each activity; develops a timeframe for implementation of the strategies; identifies whether or not additional resources are needed; and, develops a plan for evaluating whether the strategy was implemented and its effectiveness. This work group should be convened by the Massachusetts Department of Public Health.

Apart from the issues of shaken baby syndrome and suicide prevention, other issues related to traumatic brain injury as a result of violence were not included in this report. This should be the subject of further study as this work moves forward.

Debate about whether or not the recommendations presented in this report should be presented as a list of priorities was voiced in most of the meetings. Because each subgroup focused on a different topic or risk group and brought their own passions to the table, it was not possible to agree upon any particular measure which should take precedence over another. Some of the recommendations can be implemented by making small changes in programs; others need legislative or regulatory measures enacted; some may require significant funding. It is the consensus of the Task Force that all of the recommendations included in this report are important, and each can contribute to reducing the burden of traumatic brain injury in Massachusetts.

The lack of coordination of planning, implementing and evaluating traumatic brain injury prevention strategies was identified as a major issue impeding the process on moving forward. While it is recognized that to implement the strategies identified in this report requires collaboration across many public and private groups, it is necessary, and should be possible, to identify a focal point within state government responsible for overseeing the implementation of this work. Such a focal point does not currently exist.

Massachusetts has been a leader in injury prevention and surveillance programs, with strong partners in the public and private sectors. By coordinating our efforts and making the prevention of traumatic brain injury a priority, we will create a tremendous opportunity to save lives, improve the vitality of all citizens and communities and reduce the health and long-term care burden of TBI on individuals and the Commonwealth.

Appendix A. List of Agencies Participating in the TBI Task Force, by Type

Hospitals:

- 1) Children's Hospital
- 2) Boston Medical Center
- 3) Baystate Medical Center
- 4) UMass Memorial Medical Center

Private Advocacy Groups:

- 5) American Association of Retired People, MA Chapter
- 6) Children's Trust Fund
- 7) Brain Injury Association of MA
- 8) MassBike
- 9) MA SADD
- 10) MA MADD
- 11) MA Medical Society
- 12) Western MA SAFE Kids
- 13) S.A.F.E. Coalition (Group promoting primary seat belt law enforcement)

Other Private Agencies/Organizations:

- 14) Education Development Center, Suicide Prevention Program
- 15) Harvard School of Public Health
- 16) Boston University School of Public Health
- 17) Samaritans of Boston and Framingham
- 18) Rehabilitation Hospital of Cape & Islands

Public Agencies:

- 19) Mass. Office of Children, Youth & Families
- 20) Mass. Executive Office of Elder Affairs
- 21) Boston Public Health Commission, Childhood Injury Prevention Program
- 22) Mass. Executive Office of Public Safety
- 23) Office of the Chief Medical Examiner
- 24) Governor's Highway Safety Bureau
- 25) Mass. Rehabilitation Commission/Statewide Head Injury Program
- 26) Mass. Executive Office of Transportation/Bike-Pedestrian Program
- 27) Mass. Association of Chiefs of Police
- 28) Mass. Department of Conservation and Recreation
- 29) EOHHS/Service Planning & Coordination
- 30) Mass. Commission for the Blind
- 31) Mass. Department of Social Services
- 32) DPH Programs: Office of Elder Health; Occupational Health Surveillance; Violence Prevention; Injury Surveillance; Suicide Prevention; Injury Prevention & Control; Shaken Baby Syndrome Prevention.

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- ⁶ National Institute of Neurological Disorders and Stroke. Traumatic Brain Injury: hope through research. Bethesda (MD): national Institutes of Health; 2002 Feb. NIH Publication NO.: 02-158. Available from www.ninds.nih.gov/disorders/tbi/detal_tbi.htm
- ⁷ *Rehabilitation of persons with Traumatic Brain Injury*. National Institutes of Health, Consensus Development Conference Statement, 1998.
- ⁸ Thurman D, Alverson C, Dunn K, Guerro J, Snieszek J. Traumatic brain injury in the United States: a public health perspective. *Journal of Head Trauma Rehabilitation* 1999; 14(6):602-15.
- ⁹ Corrigan JD, Whiteneck G, Mellick D. Perceived needs following traumatic brain injury. *Journal of Head Trauma Rehabilitation* 2004; 19(3):205-16.
- ¹⁰ The Massachusetts TBI data is taken from the Massachusetts Department of Public Health, *Traumatic Brain Injuries in Massachusetts: Data Summary*. Injury Surveillance Program, September 2006.
- ¹¹ Massachusetts Census for Fatal Occupational Injuries, MDPH in conjunction with Federal Bureau of Labor Statistics; U.S. Department of Labor, 1992-2002.
- ¹² The Center for Universal Design at the University of North Carolina defines Universal Design as “design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design.”
- ¹³ “Preventing Falls in Public Places,” produced by Stay on Your Feet, North Coast Health Promotion, Lismore, New South Wales, 1996.
- ¹⁴ According to the Smart Growth Network, smart growth is town-centered, transit and pedestrian oriented, and has a greater mix of housing, commercial and retail uses. It also preserves open space and many other environmental amenities.”